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TRANSLATION

FOAMED PLASTICS ON A BASE OF ORGANOSILICON RESINS AND THEIR COMBINATIONS WITH ORGANIC POLYMERS

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FOAMED PLASTICS ON A BASE OF ORGANOSILICON RESINS AND THEIR COMBINATIONS WITH ORGANIC POLYMERS*

M. Ya. Borodin, Z. I. Kazakova, A. P. Koroleva, and V. A. Popov

The elastic properties and strength of foamed materials depend on their density and structure. This is mainly determined by the properties of the starting polymers composing the base of foamed plastics.

An excellent characteristic of organosilicon polymers is their very high thermostability. The purpose of our study was to elucidate the properties of organosilicon foamed plastics and to evaluate the possibilities of their use. We usedtwo types of organosilicon resins in the work. The first group included resins of foamed plastics and the second group included resins of acetyl siloxanes.

From the first group of resins we investigated most thoroughly the foamed plastic K-40 constructed from structurally rigid material. This material is produced as sheets of various sizes with a volumetric weight of 0.15-0.20.

Studies have recently been carried out for the production of formed articles. Tests show that the obtained material is completely

* Supplement to report. See No. 4, P. 42.

satisfactory with respect to its physicomechanical properties and can be used for a long time in an air medium at a temperature of 200° and higher.

A detailed study of the possibilities of using this material showed that it is necessary to take into account its shrinkage factor and low elongation at rupture (of the order of 1%). It is also necessary to take into account its coefficient of linear expansion. A comparison of these three properties shows that when the article is produced with a single heating it is possible to dry the material in the structure without bringing it to the final solid state. At the first stage of use the article is heated and thus proceeds the process of final hardening, and the material fills the structure up to the end. If cooling then follows, the material undergoes considerable shrinkage and its integrity in the structure is impaired.

The dielectric losses change little in organosilicon foamed plastics when the temperature increases. The dielectric losses of other foamed plastics increase substantially.

On the other hand, organosilicon foamed plastics are inferior to organic foamed plastics with respect to strength properties. Foamed plastics on a base of linear polymers, polystyrenes, and polyvinylchloride have the greatest strength. The strength of foamed plastics on a base of spatial polymers is somewhat lower.

It was very interesting to compare the temperature dependence of the potential properties of foamed plastics.

Organic foamed plastics have the greatest strength at normal temperatures. With a rise of temperature their strength begins to drop rapidly. The most thermostable foamed plastics on a base of spatial polymers at temperatures above 80° retain their properties to 180-200°. The strength of organosilicon foamed plastics drops with a

rise in temperature. The investigations showed that organosilicon foamed plastics are advantageously used as light fillers in heat insulation and radio engineering devices which operate for a long time at 250° and briefly at 300-350°.

Additional data have been obtained recently on certain modifications of foamed plastics with a finely dispersed aluminum powder filler.

At a normal temperature the strength of aluminum foamed plastics is substantially higher than for ordinary foamed plastics. This advantage is retained not only at normal but also at high temperatures. The strength properties of foamed materials containing aluminum do not change at temperatures from 200 to 400-450°.

At a temperature at the order of 400° a certain increase of strength is even observed. The studies showed the possibility of producing light materials with a high value of the dielectric constant. At a volumetric weight of Al of 0.36%, the dielectric constant of foamed plastic is 1.45, at 5% it is 2.5, at 10% the dielectric constant increases to 4.5.

DISCUSSION

Question. What is the elasticity of organosilicon foamed plastic?

M. Ya. Borodin. The elasticity depends on the structure of polymers. Rigid materials are produced on a base of trifunctional monomers. We also investigated a number of foamed plastics on a base of elastic polymers containing functional links. It turned out that at a normal temperature these materials have the same rigidity but become elastic upon a rise of temperature.

Now we are carrying out studies to develop formulas for more elastic materials.

Question. What is the minimum volumetric weight and moisture capacity of silicon foamed plastics?

M. Ya. Borodin. The minimum volumetric weight is 0.1 and water absorption during a 24-hour period is 20% (for an exposed foamed sample).

Question. Are the heat insulating properties of foamed plastics containing aluminum retained?

M. Ya. Borodin. Good heat insulation properties are retained in these foamed plastics in spite of the increase of the coefficient of thermal conductivity λ. For foamed plastics without aluminum $\lambda = 0.04$ and with the introduction of 5% aluminum $\lambda = \sim 0.05$.

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